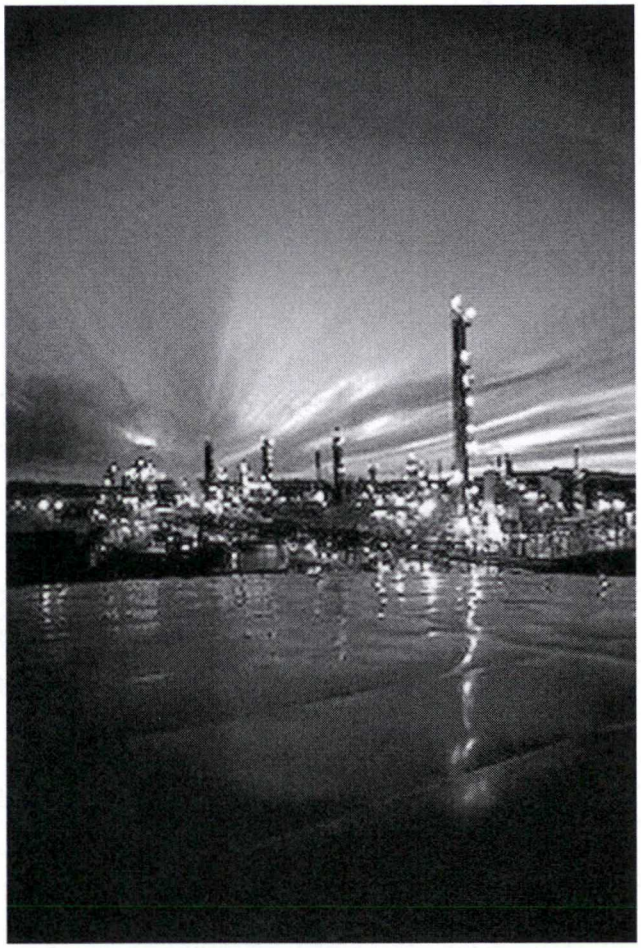
Puget Sound Shell Refinery

Anacortes, Washington

HISTORY AND INFORMATION DOCUMENT



2015

Introduction

Located on March Point near Anacortes, Wash., the refinery is situated just a few miles from the site where Shell built a terminal in 1911, marking its first entry into the US oil and gas industry. The facility, which initially was owned by Texaco, went in operation in September 1958, processing up to 45,000 barrels of crude oil per day. A half-century later, Texaco and Shell merged their refining and marketing operations in the Western U.S., including the Puget Sound plant. When Chevron acquired Texaco in 2001, Texaco sold its interest in the refinery to Shell.

Currently, the plant processes as much as 145,000 barrels (5.7 million gallons) of crude oil per day. When the refinery first began operating, most of its crude oil came from Canada via pipeline.

Although it continues to receive crude from Central and Western Canada, now most of the facility's feedstock arrives by tanker from oilfields on Alaska's North Slope.

From this crude oil, the refinery produces several products -- including three grades of gasoline, fuel oil, diesel fuel, propane, butane, petroleum coke that is used by companies that refine high-grade aluminum, sulfur, and a petrochemical called nonene.

The refinery is the single-largest taxpayer in Skagit County – and also the area's largest employer. There are 455 full-time employees.

History of Puget Sound Shell

From 1958 to 2002: Changed ownership from Texaco to Equilon to Shell.

January 1998: Texaco joined forces with Shell to form a company called Equilon Enterprises LLC. Equilon included the combined West Coast refining operations of both companies as well as transportation, lubricants and retail operations. Shell and Texaco service stations were owned or licensed by Equilon Enterprises.

October 2001: Texaco and Chevron merged to form ChevronTexaco. Texaco was required to sell its ownership in Equilon. Shell purchased Texaco's interest in Equilon and is the exclusive owner of the facility.

March 1, 2002: The Equilon Puget Sound Refining Company officially became Shell Puget Sound Refinery.

Description of the Stationary Source and Regulated Substances

Crude Unit

In this unit, water, salt and sediments are removed from the crude oil. Then the oil is routed into the Atmospheric Distillation Tower, where it is heated under pressure. The "lightest" fractions – those, such as propane, naphtha, kerosene and diesel, which have the lowest boiling points – vaporize.

They rise to the top of the tower, where they cool and condense and are sent to other units for processing. The remaining crude oil is sent to the Vacuum Pipestill (VPS). Here, the crude is heated in a vacuum, which lowers the boiling point of the fractions. Finally, the remaining oil, called heavy residuum, is sent to the Gas Oil Distillation Tower, where gas oils, or diesel distillates, are removed.

Delayed Coking Unit (DCU)

In the DCU, the heavy residuum from the Crude Unit is poured into a large drum, where it is heated to break down, or "crack," it into fractions that are sent to other units for processing. Then a high-pressure "blade" of water is used to cut the product remaining in the drum –petroleum coke -- into chunks for removal.

Fluid Catalytic Cracking Unit (FCCU)

The gas oils removed from the crude oil in the Gas Oil Distillation Tower are sent to the FCCU. In the unit's reactor, a reusable silica-alumina catalyst helps crack large oil molecules into more valuable products. A "fractionator" separates out the diesel fuel; the remaining crude oil is sent through three more distillation towers, which divide it into gasoline, fuel gas, propane and butanes. The propane and butanes serve as feedstocks for the Alkylation and Polymerization units.

Polymerization Unit

In the Polymerization Unit, propylene – a byproduct of the cracking in the DCU and FCCU – is exposed to phosphoric acid-impregnated catalyst pellets. This process re-forms it into polymer gasoline, used to help blend gasoline, as well as nonene, a feedstock for making petrochemicals.

Alkylation Units

In the Alkylation Units, propylene and another byproduct of the FCCU called butylene are mixed with isobutane and a sulfuric acid catalyst. Then the sulfuric acid is removed and the remaining product is pumped to distillation towers, where it's separated into liquefied petroleum gas (LPG), mixed butanes and alkylate, a high-octane blending component used in lead-free premium gasolines.

Hydrotreaters

Kerosene or low-octane naphtha from the Crude Unit and naphtha and diesel from the FCCU and DCU are pumped to the Hydrotreating Units. They are combined with a catalyst in a high-pressure, hydrogen-rich atmosphere, which removes sulfur and nitrogen contaminants, producing not only desulfurized hydrocarbons, but also hydrogen sulfide and ammonia. The desulfurized hydrocarbons are distilled further into low-octane naphtha and jet fuel.

Catalytic Reforming Units

In the Catalytic Reforming Units, the low-octane, desulfurized naphtha is heated and exposed to a platinum catalyst to produce reformate, a high-octane blending component for gasoline. Chemical reactions in these units also produce hydrogen, which is used in the Hydrotreating Units.

Sulfur Recovery Units

Some crude oil, called "sour" crude, contains higher levels of sulfur. In the Sulfur Recovery Unit, controlled combustion and then a catalyst are used to liquefy and remove the sulfur, which helps reduce emissions and allows the refinery to process this type of crude oil. The liquid sulfur is sold as a fertilizer ingredient.

Cogeneration Facility

The Puget Sound Refinery generates electricity as a byproduct of the refining process. It uses about 350,000 pounds of steam per hour to produce 140 megawatts of electricity— enough power for 70,000

homes. In addition, the Boiler House, which is part of the cogeneration facility, provides steam, instrument and plant air, boiler feed water and fire and service water for the refinery.

Wastewater Treatment Plant

All sewage and wastewater from the plant is treated and then tested before being discharged into Fidalgo Bay. This helps ensure that the treated water meets standards required by the refinery's NPDES (National Pollution Discharge Elimination System) permit. The plant also handles ballast water from ships and recovers oil for recycling.

RMP Submission History

Plan Sequence Number	Sub Type	EPA Facility Identifier	Facility Name	Facility City	Facility State	Receipt Date
11236	F	100000099252	Puget Sound Refining Company	Anacortes	WA	21-Jun-1999
21606	C	100000099252	Puget Sound Refining Company	Anacortes	WA	07-Jul-2000
22377	R	100000099252	Puget Sound Refining Company	Anacortes	WA	02-Jan-2001
23861	R	100000099252	Puget Sound Refining Company	Anacortes	WA	27-Jul-2001
24032	R	100000099252	Puget Sound Refining Company	Anacortes	WA	31-Aug-2001
24768	R	100000099252	Puget Sound Refining Company	Anacortes	WA	26-Dec-2001
26048	R	100000099252	Puget Sound Refinery	Anacortes	WA	21-Jun-2002
27485	R	100000099252	Puget Sound Refinery	Anacortes	WA	06-Feb-2003
28660	R	100000099252	Puget Sound Refinery	Anacortes	WA	04-Aug-2003
29694	R	100000099252	Puget Sound Refinery	Anacortes	WA	12-Mar-2004
37283	R	100000099252	Puget Sound Refinery	Anacortes	WA	23-Jun-2004
43672	R	100000099252	Puget Sound Refinery	Anacortes	WA	25-Aug-2005
45781	R	100000099252	Puget Sound Refinery	Anacortes	WA	05-Jun-2006
1000011818 C 14022 12-Mar-2014 C 10596 01-Aug-2012	R	100000099252	Puget Sound Refinery	Anacortes	WA	22-Apr-2010
1000049622	R	100000099252	Puget Sound Refinery	Anacortes	WA	22-Apr-2015

Puget Sound Shell's next RMP resubmission is April 22, 2020.

Location and Mailing Address

EPA Facility Identifier:	1000 0009 9252
Street 1:	8505 South Texas Road
Street 2:	P.O. Box 622
City:	Anacortes
State:	Washington

ZIP:	98221
County:	Skagit

Facility Latitude and Longitude

Latitude (decimal):	48.478917
Longitude (decimal):	-122.570861
Lat/Long Method:	Address Matching - House Number
Lat/Long Description:	SE Corner of Land Parcel

RMP Contact

RMP Name of Person:	Shirley Yap
RMP Title:	General Manager
RMP E-mail Address:	shirley.yap@shell.com

Accident History

RMP FIVE-YEAR ACCIDENT HISTORY: The facility has had no reported accidental releases of a regulated substance that have resulted in on-site or off-site impacts, injuries or deaths in the past 5 years.

Process Chemicals: The facility has reported 47 covered processes as a Program Level 3.

1.
Process ID:	1000062335
Description:	Tank Farm
Process Chemical ID:	1000076762
Program Level:	Program Level 3 process
Chemical Name:	Butane
CAS Number:	106-97-8
Quantity (lbs):	8,500,000
Flammable/Toxic:	Flammable

2.
Process ID:	1000062340
Description:	Hydrotreating Unit #1
Process Chemical ID:	1000076801
Program Level:	Program Level 3 process
Chemical Name:	Pentane
CAS Number:	109-66-0
Quantity (lbs):	20,000
Flammable/Toxic:	Flammable

3.
Process ID:	1000062343
Description:	Hydrotreating Unit #2
Process Chemical ID:	1000076824
Program Level:	Program Level 3 process
Chemical Name:	Isobutane [Propane, 2-methyl]
CAS Number:	75-28-5
Quantity (lbs):	26,000

Flammable/Toxic: Flammable

4. Process ID: 1000062344
   Description: Alkylation Unit #2
   Process Chemical ID: 1000076828
   Program Level: Program Level 3 process
   Chemical Name: Propane
   CAS Number: 74-98-6
   Quantity (lbs): 18,000
   Flammable/Toxic: Flammable

5. Process ID: 1000062338
   Description: Alkylation Unit #1
   Process Chemical ID: 1000076916
   Program Level: Program Level 3 process
   Chemical Name: 2-Butene-cis
   CAS Number: 590-18-1
   Quantity (lbs): 10,000
   Flammable/Toxic: Flammable

6. Process ID: 1000062339
   Description: Railcar Loading Rack
   Process Chemical ID: 1000076920
   Program Level: Program Level 3 process
   Chemical Name: Isopentane [Butane, 2-methyl-]
   CAS Number: 78-78-4
   Quantity (lbs): 48,000
   Flammable/Toxic: Flammable

7. Process ID: 1000062345
   Description: FCCU / GRU
   Process Chemical ID: 1000076924
   Program Level: Program Level 3 process
   Chemical Name: Isopentane [Butane, 2-methyl-]
   CAS Number: 78-78-4
   Quantity (lbs): 12,000
   Flammable/Toxic: Flammable

8. Process ID: 1000062347
   Description: Hydrotreating Unit #3
   Process Chemical ID: 1000076926
   Program Level: Program Level 3 process
   Chemical Name: Isopentane [Butane, 2-methyl-]
   CAS Number: 78-78-4
   Quantity (lbs): 12,000
   Flammable/Toxic: Flammable

9. Process ID: 1000062343

Description: Catalytic Reformer #2
Process Chemical ID: 1000076825
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 24,000
Flammable/Toxic: Flammable

10. Process ID: 1000062344
Description: Alkylation Unit #2
Process Chemical ID: 1000076834
Program Level: Program Level 3 process
Chemical Name: Isopentane [Butane, 2-methyl-]
CAS Number: 78-78-4
Quantity (lbs): 25,000
Flammable/Toxic: Flammable

11. Process ID: 1000062346
Description: Polymerization
Process Chemical ID: 1000076850
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 53,000
Flammable/Toxic: Flammable

12. Process ID: 1000062338
Description: Alkylation Unit #1
Process Chemical ID: 1000076917
Program Level: Program Level 3 process
Chemical Name: 2-Butene-trans [2-Butene, (E)]
CAS Number: 624-64-6
Quantity (lbs): 13,000
Flammable/Toxic: Flammable

13. Process ID: 1000062339
Description: Railcar Loading Rack
Process Chemical ID: 1000076919
Program Level: Program Level 3 process
Chemical Name: Isobutane [Propane, 2-methyl]
CAS Number: 75-28-5
Quantity (lbs): 2,300,000
Flammable/Toxic: Flammable

14. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076758

Program Level: Program Level 3 process
Chemical Name: Propane
CAS Number: 74-98-6
Quantity (lbs): 1,300,000
Flammable/Toxic: Flammable

15. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076759
Program Level: Program Level 3 process
Chemical Name: Isobutane [Propane, 2-methyl]
CAS Number: 75-28-5
Quantity (lbs): 4,200,000
Flammable/Toxic: Flammable

16. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076763
Program Level: Program Level 3 process
Chemical Name: Isopentane [Butane, 2-methyl-]
CAS Number: 78-78-4
Quantity (lbs): 7,600,000
Flammable/Toxic: Flammable

17. Process ID: 1000062338
Description: Alkylation Unit #1
Process Chemical ID: 1000076788
Program Level: Program Level 3 process
Chemical Name: Propane
CAS Number: 74-98-6
Quantity (lbs): 21,000
Flammable/Toxic: Flammable

18. Process ID: 1000062338
Description: Alkylation Unit #1
Process Chemical ID: 1000076791
Program Level: Program Level 3 process
Chemical Name: Isopentane [Butane, 2-methyl-]
CAS Number: 78-78-4
Quantity (lbs): 18,000
Flammable/Toxic: Flammable

19. Process ID: 1000062340
Description: Hydrotreating Unit #1
Process Chemical ID: 1000076799
Program Level: Program Level 3 process
Chemical Name: Butane

CAS Number: 106-97-8
Quantity (lbs): 15,000
Flammable/Toxic: Flammable

20. Process ID: 1000062346
Description: Polymerization
Process Chemical ID: 1000076848
Program Level: Program Level 3 process
Chemical Name: Propylene [1-Propene]
CAS Number: 115-07-1
Quantity (lbs): 69,000
Flammable/Toxic: Flammable

21. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076861
Program Level: Program Level 3 process
Chemical Name: 2-Methylpropene [1-Propene, 2-methyl-]
CAS Number: 115-11-7
Quantity (lbs): 150,000
Flammable/Toxic: Flammable

22. Process ID: 1000062339
Description: Railcar Loading Rack
Process Chemical ID: 1000076793
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 3,900,000
Flammable/Toxic: Flammable

23. Process ID: 1000062341
Description: Hydrotreating Unit #2
Process Chemical ID: 1000076807
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 35,000
Flammable/Toxic: Flammable

24. Process ID: 1000062341
Description: Hydrotreating Unit #2
Process Chemical ID: 1000076809
Program Level: Program Level 3 process
Chemical Name: Pentane
CAS Number: 109-66-0
Quantity (lbs): 10,000

Flammable/Toxic: Flammable

25. Process ID: 1000062343
    Description: Catalytic Reformer #2
    Process Chemical ID: 1000076826
    Program Level: Program Level 3 process
    Chemical Name: Isopentane [Butane, 2-methyl-]
    CAS Number: 78-78-4
    Quantity (lbs): 11,000
    Flammable/Toxic: Flammable

26. Process ID: 1000062345
    Description: FCCU / GRU
    Process Chemical ID: 1000076841
    Program Level: Program Level 3 process
    Chemical Name: Isobutane [Propane, 2-methyl]
    CAS Number: 75-28-5
    Quantity (lbs): 15,000
    Flammable/Toxic: Flammable

27. Process ID: 1000062346
    Description: Polymerization
    Process Chemical ID: 1000076847
    Program Level: Program Level 3 process
    Chemical Name: Propane
    CAS Number: 74-98-6
    Quantity (lbs): 230,000
    Flammable/Toxic: Flammable

28. Process ID: 1000062338
    Description: Alkylation Unit #1
    Process Chemical ID: 1000076790
    Program Level: Program Level 3 process
    Chemical Name: Butane
    CAS Number: 106-97-8
    Quantity (lbs): 51,000
    Flammable/Toxic: Flammable

29. Process ID: 1000062340
    Description: Hydrotreating Unit #1
    Process Chemical ID: 1000076800
    Program Level: Program Level 3 process
    Chemical Name: Isopentane [Butane, 2-methyl-]
    CAS Number: 78-78-4
    Quantity (lbs): 13,000
    Flammable/Toxic: Flammable

30. Process ID: 1000062344

Description: Alkylation Unit #2
Process Chemical ID: 1000076831
Program Level: Program Level 3 process
Chemical Name: Isobutane [Propane, 2-methyl]
CAS Number: 75-28-5
Quantity (lbs): 650,000
Flammable/Toxic: Flammable

31. Process ID: 1000062344
Description: Alkylation Unit #2
Process Chemical ID: 1000076832
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 150,000
Flammable/Toxic: Flammable

32. Process ID: 1000062338
Description: Alkylation Unit #1
Process Chemical ID: 1000076789
Program Level: Program Level 3 process
Chemical Name: Isobutane [Propane, 2-methyl]
CAS Number: 75-28-5
Quantity (lbs): 330,000
Flammable/Toxic: Flammable

33. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076860
Program Level: Program Level 3 process
Chemical Name: 2-Butene-trans [2-Butene, (E)]
CAS Number: 624-64-6
Quantity (lbs): 170,000
Flammable/Toxic: Flammable

34. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076859
Program Level: Program Level 3 process
Chemical Name: 2-Butene-cis
CAS Number: 590-18-1
Quantity (lbs): 240,000
Flammable/Toxic: Flammable

35. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076862

Program Level: Program Level 3 process
Chemical Name: Pentane
CAS Number: 109-66-0
Quantity (lbs): 4,000,000
Flammable/Toxic: Flammable

36. Process ID: 1000062339
Description: Railcar Loading Rack
Process Chemical ID: 1000076918
Program Level: Program Level 3 process
Chemical Name: Propane
CAS Number: 74-98-6
Quantity (lbs): 820,000
Flammable/Toxic: Flammable

37. Process ID: 1000062420
Description: Crude Distillation Unit
Process Chemical ID: 1000076950
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 8,000
Flammable/Toxic: Flammable

38. Process ID: 1000062421
Description: Delayed Coking Unit
Process Chemical ID: 1000076951
Program Level: Program Level 3 process
Chemical Name: Butane
CAS Number: 106-97-8
Quantity (lbs): 4,200
Flammable/Toxic: Flammable

39. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076764
Program Level: Program Level 3 process
Chemical Name: Propylene [1-Propene]
CAS Number: 115-07-1
Quantity (lbs): 180,000
Flammable/Toxic: Flammable

40. Process ID: 1000062342
Description: Catalytic Reformer #1
Process Chemical ID: 1000076817
Program Level: Program Level 3 process
Chemical Name: Isopentane [Butane, 2-methyl-]

CAS Number: 78-78-4
Quantity (lbs): 17,000
Flammable/Toxic: Flammable

41. Process ID: 1000062346
Description: Polymerization
Process Chemical ID: 1000076849
Program Level: Program Level 3 process
Chemical Name: Isobutane [Propane, 2-methyl]
CAS Number: 75-28-5
Quantity (lbs): 45,000
Flammable/Toxic: Flammable

42. Process ID: 1000062339
Description: Railcar Loading Rack
Process Chemical ID: 1000076921
Program Level: Program Level 3 process
Chemical Name: Propylene [1-Propene]
CAS Number: 115-07-1
Quantity (lbs): 50,000
Flammable/Toxic: Flammable

43. Process ID: 1000062335
Description: Tank Farm
Process Chemical ID: 1000076760
Program Level: Program Level 3 process
Chemical Name: 1-Butene
CAS Number: 106-98-9
Quantity (lbs): 170,000
Flammable/Toxic: Flammable

44. Process ID: 1000062343
Description: Catalytic Reformer #2
Process Chemical ID: 1000076822
Program Level: Program Level 3 process
Chemical Name: Propane
CAS Number: 74-98-6
Quantity (lbs): 21,000
Flammable/Toxic: Flammable

45. Process ID: 1000062345
Description: FCCU / GRU
Process Chemical ID: 1000076840
Program Level: Program Level 3 process
Chemical Name: Propylene [1-Propene]
CAS Number: 115-07-1
Quantity (lbs): 19,000

	Flammable/Toxic:	Flammable
46.	Process ID:	1000062348
	Description:	Boiler House/Cogeneration
	Process Chemical ID:	1000076858
	Program Level:	Program Level 3 process
	Chemical Name:	Ammonia (anhydrous)
	CAS Number:	7664-41-7
	Quantity (lbs):	91,000
	Flammable/Toxic:	Flammable
47.	Process ID:	1000062335
	Description:	Tank Farm
	Process Chemical ID:	1000076863
	Program Level:	Program Level 3 process
	Chemical Name:	Ethane
	CAS Number:	74-84-0
	Quantity (lbs):	47,000
	Flammable/Toxic:	Flammable

References

http://www.shell.us/aboutshell/projects-locations/puget-sound/about.html

https://cdx.epa.gov/